Abstract

OBJECTIVES

Impulsivity, the tendency to act quickly without adequate planning or concern for consequences, is a commonly cited risk factor for suicidal thoughts and behaviour. There are many definitions of impulsivity and how it relates to suicidality is not well understood. Mood instability, which describes frequent fluctuations of mood over time, is a concept related to impulsivity that may help explain this relationship. The purpose of this study was to determine if impulsivity could predict suicidal thoughts after controlling for mood instability.

METHODS

This study utilized longitudinal data from the 2000 Adult Psychiatric Morbidity Survey (N = 2,406). There was a time interval of 18 months between the two waves of the study. Trait impulsivity and mood instability were measured with the Structured Clinical Interview for DSM-IV Axis II Personality Disorders. Logistic regression analyses were used to evaluate baseline impulsivity and mood instability as predictors of future suicidal thoughts.

RESULTS

Impulsivity significantly predicted the presence of suicidal thoughts but this effect became nonsignificant with mood instability included in the same model.

CONCLUSIONS

Impulsivity may be a redundant concept when predicting future suicidal thoughts if mood instability is considered. The significance is that research and therapy focusing on mood instability along with impulsivity may be useful in treating the suicidal patient.

Practitioner points

- Mood instability and impulsivity both predict future suicidal thoughts.
- Impulsivity does not predict suicidal thoughts after controlling for mood instability.
- Assessing and treating mood instability could be important aspects of suicide prevention and risk management.

Suicide is the 10th leading cause of death worldwide (Hawton & van Heeringen, 2009), and 90% of people who die from suicide appear to have suffered from a psychiatric disorder at the time of their death (Hawton, Casañas, Comabella, Haw, & Saunders, 2013). Among them approximately one half to two thirds have been diagnosed with depression but many others experience depressive symptoms (Hawton et al., 2013; (Rhodes & Bethell, 2008). Particularly in people who are depressed (Corruble, Damy, & Guelfi, 1999; Mann, Waternaux, Haas, & Malone, 1999), impulsivity is often cited (along with other factors) as an explanation for suicidal thoughts and behaviour (Conner, Meldrum, Wieczorek, Duberstein, & Welte, 2004; Klonsky & May, 2010). Impulsivity is a multifaceted construct, generally understood to mean a tendency to act quickly and unpredictably without apparent concern for consequences (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001; Whiteside & Lynam, 2001). While enormous efforts have been directed at understanding and reducing suicidal behaviour in depression, rates remain stubbornly high (Kessler, Berglund, Borges, Nock, & Wang, 2005). One reason for this might be the incomplete understanding of the nature of impulsivity and how it affects suicidal thinking and behaviour.

The relationship between impulsivity and suicidal behaviour appears intuitive in the sense that impulsive individuals might be expected to be more likely to act on suicidal feelings (Mann et al., 1999). Impulsivity and suicidal thinking have been shown to be linked by decision-making processes, serotonin and frontal-limbic systems (Chistiakov, Kekelidze, & Chekhonin, 2012). One study that used a multidimensional measure of impulsivity reported that only urgency, a tendency to behave impulsively when experiencing negative affect, differentiated suicidal ideators from nonideators (Klonsky

& May, 2010). A possible connection is that urgency relates to the personality trait neuroticism (Klonsky & May, 2010), a known correlate of depression and suicidal ideation (Bowen, Baetz, Leuschen, & Kalynchuk, 2011). Mood instability, defined as "extreme and frequent fluctuations of mood over time" (Trull et al., 2008), is the essential component of neuroticism (Bowen, Balbuena, Leuschen, & Baetz, 2012) and is also a reliable predictor of suicidal thinking (Bowen et al., 2011; Marwaha, Parsons, & Broome, 2013). Mood instability overlaps with emotional dysregulation and impulsivity most notably in borderline personality disorder (American Psychiatric Association, 2013).

A previous study described the sociodemographic and clinical variables that influence the development of suicidal thoughts in the same population that we studied (Gunnell, Harbord, Singleton, Jenkins, & Lewis, 2004). The authors did not examine the influence of personality traits but implicated mood instability as potentially relevant. Our study attempted to extend this research by examining mood instability and impulsivity as possible trait predictors of future suicidal ideation. We also sought to determine if controlling for mood instability could account for the relationship between impulsivity and suicidal thoughts. We hypothesized that impulsivity and mood instability would separately predict suicidal ideation, but only mood instability would remain significant when both variables were entered into the same regression equation.

Methods

Sample

The sample included questionnaire respondents from the 2000 Adult Psychiatric Morbidity Survey (APMS; Singleton, Lee, & Meltzer, 2002). The goal of the APMS was to collect information on mental illness and related variables for adults aged 16 to 74

living in England, Scotland, and Wales (Singleton et al., 2002). Data from the 2000 APMS was chosen over the newer 2007 APMS because the 2000 survey included a longitudinal component in addition to the main cross-sectional survey. The initial cross-sectional survey utilized structured interviews and screening instruments to assess for mental illness and related topics (Singleton et al., 2002). For the longitudinal component a subsample of respondents was reassessed at 18 months. Three groups of participants were selected for the follow-up survey based on their mental health status at the time of the initial survey: (1) individuals with a mental disorder (n = 1,685), defined as a score of 12 or higher on the revised Clinical Interview Schedule (CIS-R; Lewis & Pelosi, 1990); (2) individuals without a mental disorder but with some symptoms of common mental illnesses (n = 1,032), defined as CIS-R scores between 6 and 11; and (3) individuals without a mental disorder and few symptoms of common mental illnesses (n = 819), defined as CIS-R scores between 0 and 5 (Singleton & Lewis, 2003). Therefore, the respondents eligible to complete the follow-up survey were more likely to have a mental illness or related symptoms. Of these participants, 3,045 could be contacted and 2,406 were interviewed (Singleton & Lewis, 2003). There were few differences between responders and nonresponders in terms of their mental health during the initial survey, although nonresponders were younger, of lower socioeconomic status, more often single, and slightly more likely to smoke cigarettes or have used illicit drugs in the past year (Singleton & Lewis, 2003).

Instruments and Measures

Mood instability and impulsivity were assessed at Time 1 with the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II; First, Gibbon,

Spitzer, Williams, & Benjamin, 1997). Unstable moods and impulsivity are core symptoms of borderline personality disorder and the SCID-II contains items that directly assess these traits (American Psychiatric Association, 2013; First et al., 1997). The presence or absence of mood instability was operationalized as a "Yes" or "No" response to the question "Do you have a lot of sudden mood changes?" This item has been used previously as a measure of mood instability that correlates with suicidal thoughts and has displayed convergent and discriminant validity (Marwaha et al., 2013; Ryder, Costa, & Bagby, 2007). The presence of impulsivity was operationalized as a "Yes" or "No" response to the question "Have you often done things impulsively?" This item correlates with a general measure of personality and has also displayed convergent and discriminate validity (Ryder et al., 2007).

Suicidal ideation in the past year was assessed at Time 2. The presence or absence of suicidal ideation was operationalized as a "Yes" or "No" response to the question "Have you ever thought of taking your life, even though you would not actually do it?" if the respondent also indicated this had occurred in the past year. The APMS contains similar items (e.g., "Have you ever felt that life was not worth living?") that have been combined into a broad measure of suicidal ideation (Singleton & Lewis, 2003). However, we restricted our definition of suicidal ideation to the single item because it directly questions the intended construct (Gunnell et al., 2004).

In addition to age and sex, we controlled for: (1) baseline depression measured by the CIS-R with a depression score ranging from 0 to 4; (2) living arrangements which had three levels: married/cohabiting, single, and widowed/divorced/separated; and (3) employment status which had three categories: employed, unemployed, and economically

inactive. Depression is a well-known predictor of suicidal thinking that correlates with mood instability (Bowen et al., 2011) and impulsivity (Peluso et al., 2007). Being single and unemployed are also related to the development of suicidal thoughts (Gunnell et al., 2004).

Data Analyses

The analyses were conducted using survey estimation commands that took into account the survey design of the APMS by using survey weights to adjust for different response rates among respondent groups and loss to follow-up. We used a subpopulation command so that estimates were calculated using data from only participants who had complete data for the variables of interest (n = 2,338). Standard errors were calculated with data from the entire follow-up sample (N = 2,406) using Taylor linearization. All statistical analyses were carried out with Stata (Stata: Data Analysis and Statistical Software, Version 12).

We used sequential logistic regression analyses to predict suicidal ideation at Time 2. Logistic regression was chosen due to the binary nature of the dependent variable. Time 1 age, sex, living situation, employment status, and depression were included as predictors in the baseline model (Model 1). Time 1 impulsivity was added in Model 2. Time 1 mood instability was added in Model 3. In Model 4 we allowed for an interaction between mood instability and impulsivity. To determine if the results differed across levels of depression, we estimated two additional models (5 and 6) that excluded depression as a predictor variable but were restricted to include participants with CIS-R depression scores of either 0 (n = 1,507) or 1 to 4 (n = 834). We choose to categorize participants based on depressed mood at Time 1 because impulsivity is more common in

people who are depressed (Peluso et al., 2007) and appears to increase their risk of suicide (Corruble et al., 1999). After each model we tested for multicollinearity by calculating variance inflation factors for each predictor variable.

Results

Demographic and clinical information for the final sample (n = 2,338) is presented in Table 1. Results of the logistic regression analyses are presented in Tables 2 to 4. Time 2 suicidal ideation was significantly predicted by Time 1 impulsivity (OR = 1.69, p = .02) in Model 2 (see Table 2). When mood instability was added in Model 3 (see Table 3), the effect for impulsivity became nonsignificant (OR = 1.42, p = .09), whereas the effect for mood instability was significant (OR = 3.82; p < .001). The interaction between mood instability and impulsivity was nonsignificant (OR = 1.54, p = .31) in Model 4 (see Table 3) and was excluded from subsequent models. Depression was also a significant predictor in all four models.

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The same pattern of results remained regardless of whether participants had depressed mood at Time 1 (see Table 4). In Model 5 among participants without depression the effect for mood instability was significant (OR = 5.08, p < .001) and for impulsivity nonsignificant (OR = 1.14, p = .68). In Model 6 among participants with depression the effect for mood instability was significant (OR = 2.74, p < .001) and for impulsivity nonsignificant (OR = 1.50, p = .13).

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For each model the variance inflation factors were less than 2 (results not shown), suggesting an absence of multicollinearity. Mood instability and impulsivity were associated $\chi^2(1) = 52.85$, $p < .001$, with 60 percent of respondents with mood instability reporting impulsivity as well.

Discussion

The main finding from this study is that although impulsivity predicts suicidal ideation this effect becomes nonsignificant after mood instability is controlled. This suggests that most of the correlation between impulsivity and suicidal ideation occurs indirectly because both variables are related to mood instability. It should be noted, however, that the significant effect for impulsivity was not much larger than the nonsignificant effects. Therefore, it is difficult to say that controlling for mood instability fully accounted for the relationship between impulsivity and suicidal ideation. What remains clear from the results is that impulsivity did not provide any significant predictive utility after mood instability had been considered. In arriving at this conclusion we used longitudinal data with a time interval of 18 months and controlled for severity of depression. The cross-sectional association of mood instability with suicidal ideation (Bowen et al., 2011; Marwaha et al., 2013) and attempts (Palmier-Claus, Taylor, Varese, & Pratt, 2012) has already been established. Our results advance this literature by showing that mood instability predicts future suicidal ideation as well, and might be a more useful concept than impulsivity.

There are many possible links between mood instability and impulsive behaviour. Actions in response to sudden mood changes might appear sudden, risky, and without

consideration for long-term consequences and are therefore labelled “impulsive” (Bowen et al., 2012). It has also been proposed that impulsive behaviours are often attempts to control dysregulated emotions (Anestis et al., 2009; Selby, Anestis, & Joiner, 2008). Accordingly, mood instability has been found to predict impulsive behaviours in a clinical sample even after controlling for trait impulsivity (Anestis et al., 2009).

The clinical significance of this study is that it would be helpful for clinicians to assess and treat mood instability as well as impulsivity in managing patients with suicidal thoughts. This strategy may be more effective because there are indications that mood instability responds to treatment with mood stabilizers (Bowen, Balbuena, & Baetz, 2014), and adequate sleep and exercise (Bowen, Balbuena, Baetz, & Schwartz, 2013), as well as several psychological therapies (Jones, Sellwood, & McGovern, 2005). Obviously more research is needed on other interventions that stabilize mood. Our findings are consistent with evidence that impulsive aggression responds to mood stabilizers (Jones et al., 2011) and suicidal tendencies respond to lithium (Cipriani, Hawton, Stockton, & Geddes, 2013). The underlying mechanism may actually involve a main effect on mood instability as well as depression. Several large national studies have shown that suicidal ideation is strongly associated with suicide attempts (Bebbington et al., 2010; Kessler et al., 2005). Therefore, further research into the association between mood instability and suicidal thinking and acts might provide answers to the conundrum about the stable suicide rate despite efforts to treat depression (Johnson, Hayes, Brown, Hoo, & Ethier, 2014).

There are other reasons for emphasizing research on mood instability rather than impulsivity. Mood instability is an empirically grounded concept based on patients’

immediate frequent repeated reports of mood in written diaries (Bowen, Baetz, Hawkes, & Bowen, 2006) or electronic devices (Trull et al., 2008). Because mood is recorded immediately, the retrospective distortions associated with mood rating scales are avoided (Anestis et al., 2010; Ben-Zeev & Young, 2010). Similarly, retrospective summary diagnoses of depression may occlude the existence of mood instability (Solhan, Trull, Jahng, & Wood, 2009).

The main limitation of this study was the use of single-item measures for impulsivity, mood instability and suicidal behaviour. Ecological momentary assessment is not feasible for large national studies, and therefore we used relevant questions that are embedded as symptoms in diagnostic clusters in the SCID-II (Marwaha, Broome, Bebbington, Kuipers, & Freeman, 2014). The questions directly query the intended constructs and seemed readily comprehensible given that very few participants declined to answer them (Marwaha et al., 2014). Specific questions on mood instability yield results that are comparable to prospective ratings (Anestis et al., 2010; Solhan et al., 2009). A single-item assessment of suicidal thinking has also been shown to be a valid measure compared across scales (Desseilles et al., 2012). The findings are therefore preliminary but are noteworthy because of the seriousness and apparent impenetrability of the worldwide suicide problem (Hawton & van Heeringen, 2009). The use of older data may be seen as a limitation, although our concern was not with prevalence but with the relationships between constructs that would not necessarily be expected to change over time. Accordingly, mood instability remained associated with suicidal ideation in the results of the 2007 APMS (Marwaha et al., 2013). It is also apparent that this study

addresses suicidal thinking and not suicide attempts. Further research is needed on whether mood instability also predicts future suicidal acts.

Conclusions

Impulsivity and mood instability predict future suicidal ideation. However, when included in the same model only mood instability remains a significant predictor. This suggests that impulsivity mostly relates to suicidal ideation indirectly by being related to mood instability.

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Table 1

Demographic and clinical characteristics of APMS participants who completed the 18-month follow-up survey

Demographic information	Number of participants	Weighted estimate or proportion
Mean Age (S.E.)	44.61(.31)	43.38 (.51)
Sex		
Male	998	49.7
Female	1,340	50.3
Living situation		
Married or cohabiting	1,410	68.3
Single	428	20.1
Widowed/Divorced/Separated	500	11.6
Employment		
Employed	1,451	67.0
Unemployed	79	2.9
Inactive	808	30.1
Clinical information		
Anxiety disorder[a]	320	6.3
Depressive episode	121	2.5
Mixed anxiety/depression	405	8.9
Psychosis	16	0.3
Alcohol problem	656	24.7

Drug dependence	123	3.8
Any personality disorder	864	27.9
Received psychotropic medication or counselling	316	7.0

Note. All measurements occurred at Time 1.

[a]Includes panic disorder, generalized anxiety disorder, obsessive-compulsive disorder, phobias, and agoraphobia.

Table 2

Sequential logistic regression predicting Time 2 suicidal ideation with demographic variables and depression as predictors in Model 1 and with impulsivity added in Model 2

	Model 1 $F(5, 407) = 28.6$***			Model 2 $F(6, 406) = 24.0$***		
Predictors	*OR* (*SE*)	95% *CI*	*t*	*OR* (*SE*)	95% *CI*	*t*
Age	0.97 (.01)	0.96 - 0.99	-4.04***	0.97 (.01)	0.96 - 0.98	-4.10***
Sex	1.28 (.29)	0.83 - 2.00	1.11	1.28 (.28)	0.83 - 1.28	1.10
LA	1.72 (.21)	1.35 - 2.19	4.44***	1.67 (.21)	1.30 - 2.13	4.09***
ES	1.37 (.16)	1.09 - 1.72	2.70**	1.39 (.16)	1.11 - 1.75	2.86***
Dep	1.93 (.14)	1.67 - 2.23	9.05***	1.88 (.14)	1.63 - 2.17	8.55***
Imp		-----		1.69 (.36)	1.10 - 2.57	2.43*
MI		-----			-----	

Note. All predictors were measured at Time 1. LA = living arrangement; ES = employment status; Dep = depression; Imp = impulsivity; MI = mood instability.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$

Table 3

Sequential logistic regression predicting Time 2 suicidal ideation with mood instability added in Model 3 and with an interaction between impulsivity and mood instability added in Model 4

	Model 3 $F(7, 405) = 26.8$***			Model 4 $F(8, 404) = 24.3$***		
Predictors	*OR* (*SE*)	95% *CI*	*t*	*OR* (*SE*)	95% *CI*	*t*
Age	0.97 (.01)	0.96 - 0.99	-2.61***	0.98 (.01)	0.97 - 1.00	-2.57*
Sex	1.09 (.25)	0.70 - 1.70	0.40	1.11 (.25)	0.71 - 1.72	0.46
LA	1.73 (.22)	1.36 - 2.21	4.41***	1.75 (.22)	1.36 - 2.24	4.44***
ES	1.27 (.15)	1.01 - 1.60	2.07*	1.26 (.15)	1.00 - 1.59	1.97
Dep	1.60 (.13)	1.36 - 1.88	5.70***	1.61 (.13)	1.37 - 1.89	5.83***
Imp	1.43 (.30)	0.94 - 2.15	1.69	1.19 (.34)	0.68 - 2.08	0.62
MI	3.82 (.87)	2.44 - 5.99	5.86***	2.97 (.96)	1.56 - 5.60	3.34**
Imp x MI		-----		1.53 (.64)	0.67 - 3.48	1.02

Note. All predictors were measured at Time 1. LA = living arrangement; ES = employment status; Dep = depression; Imp = impulsivity; MI = mood instability.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$

Table 4

Sequential logistic regression predicting Time 2 suicidal ideation including nondepressed participants in Model 5 and participants with depressed mood at Time 1 in Model 6

	Model 5			Model 6		
	$F(6, 406) = 11.0$***			$F(6, 406) = 8.06$***		
	No depression (n = 1,506)			Depression (n = 832)		
Predictors	*OR* (*SE*)	95% *CI*	*t*	*OR* (*SE*)	95% *CI*	*t*
Age	0.98 (.01)	0.98 - 1.01	-1.40	0.98 (.01)	0.96 - 1.00	-2.23*
Sex	1.03 (.36)	0.52 - 2.03	0.08	0.97 (.28)	0.55 - 1.72	-0.11
LA	2.77 (.58)	1.84 - 4.19	4.87***	1.16 (.16)	0.88 - 1.52	1.07
ES	1.00 (.20)	0.68 - 1.47	0.00	1.62 (.24)	1.21 - 2.17	3.24**
Imp	1.14 (.37)	0.60 - 2.15	0.41	1.50 (.40)	0.89 - 2.54	1.52
MI	5.08 (1.8)	2.50 - 10.3	4.50***	2.74 (.72)	1.63 - 4.59	3.82***

Note. All predictors were measured at Time 1. LA = living arrangement; ES = employment status; Dep = depression; Imp = impulsivity; MI = mood instability.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$